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WASHING COMPOSITION FOR COINS, MANUFACTURING METHOD OF SAME, AND  
WASHING METHOD OF COINS USING SAME

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### Abstract

#### Objective

In banks, when coins are to be washed quickly, there are the following requirements, which, however, cannot be met yet.

(1) The coins recovered by the bank should be washed in a short time, for example, within 1 min, with imparting of antibacterial property included in the washing operation.

(2) The noise should be minimal during washing.

(3) There should be no offensive odor as would be emitted from the conventional washing solution for metal parts.

(4) The washing operation should be able to be carried out simply by any bank staff member.

#### Means to solve

The washing [solution] composition prepared includes the following ingredients added to water: an organic acid which has a stable corrosion function on metal and is harmless to the human

body, and, as needed, a metal ion blocking agent which can inactivate the components contained in the water, acting to increase the water hardness and the metal ions contained in the dirt, a surfactant and a bactericide.

#### Claims

1. A type of washing composition for coins, characterized by the fact that the washing composition for coins contains water, and an organic acid which has a stable corrosion effect for metal and is harmless to the human body.

2. A type of washing composition for coins, characterized by the fact that the washing composition for coins contains water, an organic acid which has a stable corrosion effect for metal and is harmless to the human body, a surfactant, and a bactericide.

3. A type of washing composition for coins, characterized by the fact that the washing composition for coins contains water, an organic acid which has a stable corrosion effect for metal and is harmless to the human body, and a metal ion blocking agent which can inactivate the metal ions contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt.

4. A type of washing composition for coins, characterized by the fact that the washing composition for coins contains water, an organic acid which has a stable corrosion effect for metal and is harmless to the human body, a metal ion blocking agent which can inactivate the metal ions contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, a surfactant, and a bactericide.

5. The washing composition for coins described in Claim 1, 2, 3, or 4, characterized by the fact that the organic acid which has a stable corrosion effect on metal and is harmless to the human body is sulfamic acid.

6. The washing composition for coins described in Claim 3 or 4, characterized by the fact that the aforementioned metal ion blocking agent is a food additive.

7. The washing composition for coins described in Claim 3 or 4, characterized by the fact that the aforementioned metal ion blocking agent is citric acid, gluconic acid, or glycolic acid.

8. A method for manufacturing washing composition for coins, characterized by the fact that the method for manufacturing washing composition for coins consists of the following steps:

a step in which water is heated;

a step in which an organic acid which has a stable corrosion function on metal and is harmless to the human body and a metal ion blocking agent which inactivates the components contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, are added and dissolved in the aforementioned heated water;

and a step in which the surfactant and bactericide are added while the aforementioned solution is still warm.

9. A method for washing coins using said washing composition, characterized by the fact that in the washing method of coins using the washing composition for coins, there is a step in which coins are loaded in the washing composition described in Claim 1, 2, 3, 4, 5, 6 or 7 and are subjected to ultrasonic washing.

10. A method for washing coins using said washing composition, characterized by the fact that in the washing method

of coins using the washing composition for coins, there are the following steps:

a step in which coins are loaded in the washing composition described in Claim 1, 2, 3, 4, 5, 6 or 7 and are subjected to ultrasonic washing;

a step in which the coins are removed from the washing composition and are loaded into hot water for ultrasonic washing;

and a step in which the coins are taken out from the hot water and are dried.

#### Detailed explanation of the invention

[0001]

#### Technical field of the invention

This invention pertains to a type of washing composition for coins, a method for manufacturing the washing composition for coins, and a method for washing coins using the washing composition. More specifically, this invention provides a type of washing composition for coins which is not harmful to the human body even when the washing composition comes in contact with the human body during the manufacturing process and during use of the washing composition in washing coins, and which has no offensive odor and [whose use creates] no noise. This invention also pertains to its manufacturing method and the method of washing coins using the washing composition.

[0002]

Prior art

At present, coins (including old coins) are used every day by people. Although people often wash their hands after doing many chores in their daily life, nobody washes their hands after touching coins. That is amazing. At present, Japan issues coins with values of 1 yen, 5 yen, 10 yen, 50 yen, 100 yen, 500 yen, etc. As coins are passed from one person to another, they become contaminated and become dirty.

[0003]

After new coins are issued by a bank, they are circulated on the market, recovered by the bank, and sent out for circulation again. It is believed that the coins collected back by the bank should be washed by the bank to make them clean and aesthetically pleasing. The following are requirements on washing coins in the bank:

- (1) The coins recovered by the bank should be washed in a short time, for example, within 1 min, with imparting of antibacterial property included in the washing operation.
- (2) The noise should be minimal during washing.
- (3) There should be no offensive odor as would be emitted from the conventional washing solution for metal parts.
- (4) The washing operation should be able to be carried out simply by any bank staff member.



[0004]

Among Japanese coins, the 5-yen and 10-yen coins look ugly. They are mainly made of copper. Copper has an ionization tendency lower than that of hydrogen, and it is not substituted by hydrogen ions in aqueous solution. Consequently, copper has high resistance to corrosion at low temperature for aqueous solutions of hydrochloric acid, phosphoric acid, sulfuric acid, acetic acid, etc., which do not have oxidation function. However, corrosion takes place when the aforementioned acids coexist with oxygen in the air. Of course, in nitric acid or other oxidative acids, corrosion takes place drastically, and the copper is dissolved. On the other hand, for chromic acid, although it is an oxidative acid, insoluble chromate salt is formed, so that corrosion cannot progress. Also, the aqueous solutions of ammonium salts, cyanides, etc., can form a soluble complex salt and dissolve copper. Also, together with moisture and oxygen, ammonium becomes corrosive. In an alkaline aqueous solution, the oxide of copper is relatively resistant to corrosion. However, corrosion takes place at a high temperature in a concentrated solution of sodium hydroxide.

[0005]

Problems to be solved by the invention

As explained in the above, hydrochloric acid and other inorganic acids, as well as alkali salts can corrode copper in the presence of oxygen and water. That is, they have cleanability. However, aqueous solutions of these inorganic acids

and alkali salts have a significant irritating odor. Also, when they are in contact with the human body, they can seriously corrode the skin, etc., and this is very dangerous. Consequently, it is still impossible to meet all of the four requirements for washing coins in banks.

[0006]

The purpose of this invention is to solve the aforementioned problems of the conventional technology by providing a type of washing composition for coins, a method for manufacturing the washing composition, and a method for washing coins using the washing composition.

[0007]

Means to solve the problems

In order to solve the aforementioned problem, this invention provides the following features. The first invention provides a type of washing composition for coins characterized by the fact that the washing composition for coins contains water and an organic acid which has a stable corrosion effect for metal and is harmless to the human body.

[0008]

The second invention provides a type of washing composition for coins, characterized by the fact that the washing composition

for coins contains water, an organic acid which has a stable corrosion effect for metal and is harmless to the human body, a surfactant, and a bactericide.

[0009]

The third invention provides a type of washing composition for coins, characterized by the fact that the washing composition for coins contains water, an organic acid which has a stable corrosion effect for metal and is harmless to the human body, and a metal ion blocking agent which can inactivate the metal ions contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt.

[0010]

The fourth invention provides a type of washing composition for coins, characterized by the fact that the washing composition for coins contains water, an organic acid which has a stable corrosion effect for metal and is harmless to the human body, a metal ion blocking agent which can inactivate the metal ions contained in the water, acting to increase the hardness of water and metal ions contained in the dirt, a surfactant, and a bactericide.

[0011]

The fifth invention pertains to the washing composition for coins described in invention 1, 2, 3, or 4, characterized by the

fact that the organic acid which has a stable corrosion effect on metal and is harmless to the human body is sulfamic acid.

[0012]

The sixth invention pertains to the washing composition for coins described in invention 3 or 4, characterized by the fact that the aforementioned metal ion blocking agent is a food additive.

[0013]

The seventh invention pertains to the washing composition for coins described in Claim 3 or 4, characterized by the fact that the aforementioned metal ion blocking agent is citric acid, gluconic acid, or glycolic acid.

[0014]

The eighth invention pertains to a method for manufacturing a washing composition for coins, characterized by the fact that the method for manufacturing a washing composition for coins consists of the following steps: a step in which water is heated; a step in which an organic acid which has a stable corrosion function on metal and is harmless to the human body and a metal ion blocking agent which inactivates the components contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, are added and dissolved in the aforementioned heated water; and a step in which the surfactant

and bactericide are added while the aforementioned solution is still warm.

[0015]

The ninth invention provides a method for washing coins using the washing composition, characterized by the fact that in the washing method of coins using the washing composition for coins, there is a step in which coins are loaded in the washing composition described in invention 1, 2, 3, 4, 5, 6 or 7 and are subjected to ultrasonic washing.

[0016]

The tenth invention provides a method for washing coins using the washing composition, characterized by the fact that in the washing method of coins using the washing composition for coins, there are the following steps: a step in which coins are loaded in the washing composition described in invention 1, 2, 3, 4, 5, 6 or 7 and are subjected to ultrasonic washing; a step in which the coins are removed from the washing composition, and are loaded into hot water for ultrasonic washing; and a step in which the coins are taken out from the hot water and are dried.

[0017]

In the aforementioned invention, sulfamic acid is the first choice as the organic acid which has a stable corrosion effect on metal and is harmless to the human body. This acid has a stable corrosion effect, and it can reliably convert earth, oil,

protein, and other dirty substances commonly present in daily life to substances that can easily be dissolved or dispersed in water. Also, it is possible to make use of oxalic acid or other organic acids having the same effect. The amount of the aforementioned organic acid with respect to 100 parts by weight water should be in the range of 30-80 parts by weight. As far as the state of the attached substance on the surface of the coins is concerned, when the amount of the attached substance is large, the amount [of organic acid should be] about 80 parts by weight. The amount should be at least about 30 parts by weight.

[0018]

Examples of the metal ion blocking agents include citric acid, gluconic acid, and glycolic acid. With -OH groups and -COOH groups contained in their molecules, they can bond with the metal ions in the hard components and dirt in water to make them inactive, so as to assist the corrosion effect and to promote the cleaning function. Also, as they are classified as food additives, they are harmless to the human body. The aforementioned citric acid, gluconic acid, glycolic acid, etc., are included in the hydroxycarbonate type, aminocarbonate type, and hydroxyaminocarbonate type organic acids. Among these types, the organic acids having the same effects can also be used. The amount of the aforementioned organic acid with respect to 100 parts by weight of water usually should be in the range of 5-20 parts by weight. As far as the state of the substance attached on the surface of the coins is concerned, when the amount of the attached substance is large, the amount of the

organic acid should be about 20 parts by weight, and it should be at least about 5 parts by weight.

[0019]

The surfactant acts as a detergent with respect to the functions of wetting, penetration, micelle formation, etc. It is possible to make use of various types of surfactants, such as cationic, anionic, nonionic and amphoteric surfactants. The nonionic surfactant is most frequently used, as it also acts to inhibit reattachment of dirt. Examples of the nonionic surfactants include alkylphenol type, ether type, ester type, sorbitan ester type, etc. The amount of the aforementioned surfactant with respect to 100 parts by weight water should be in the range of 1-8 parts by weight. As far as the state of the substance attached on the surface of the coins is concerned, when the amount of the attached substance is large, the amount of the surfactant should be about 8 parts by weight, and it should be at least about 1 part by weight.

[0020]

The bactericide is applied to prevent attachment of various species of bacteria when the washed coins are circulated back to the market. The cationic bactericides and anionic bactericides are mainly used. Examples of the cationic bactericides include hexadecyltrimethylammonium chloride, didecyldimethylammonium chloride, alkyldimethylbenzylammonium chloride, octadecyldimethylbenzylammonium chloride, tetraacyldimethylbenzylammonium chloride, dioleyldimethylammonium

chloride, polyoxyethylenedodecylmonomethylammonium chloride, etc. Examples of the anionic bactericides include alkylglycyl, etc. The amount of the bactericide used with respect to 100 parts by weight water is usually in the range of 0.1-1 part by weight.

[0021]

When the washing composition for coins is prepared, in order to ensure quick and complete dissolution of the other ingredients added, water is usually heated to 60-80°C, and stirring is performed. Also, when the washing composition for coins is used to wash coins, ultrasonic waves may be used.

[0022]

#### Function

The aforementioned washing composition for coins has a stable corrosion effect on metal and is harmless to the human body. As it contains an organic acid that can remove the dirt attached on coins, it is possible to clean the coins indoors safely in a short time without an irritating odor or other offensive odor. Also, since the aforementioned washing composition contains a metal ion blocking agent which inactivates the components contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, it is possible to promote the corrosion effect of the aforementioned organic acid, so that washing can be made in an even shorter time. Also, as it is a food additive, it is safe even when the



washing composition makes contact with the human body during the washing operation.

[0023]

In addition, as a surfactant is contained, it is possible to remove the substance attached on the surface of the coins due to the detergent effects of wetting, penetration, micelle formation, etc. Also, it is possible to prevent the dirt from reattaching on the surface of the washed coins. In addition, as a bactericide is also contained, when the coins are washed and reissued, attachment of various species of bacteria can be prevented.

[0024]

When the aforementioned washing composition for coins is prepared, usually, water is heated to 60-80°C, and the operation is carried out while being stirred. Consequently, it is possible to ensure quick and complete dissolution of the components added. Also, when coins are washed, as ultrasonic waves are used, there is no noise, and the operation can be carried out even quicker.

[0025]

#### Application examples

In the following, this invention will be explained in more detail with reference to application examples. Sulfamic acid was used as the organic acid which has a stable corrosion effect on metal and is harmless to the human body. As the metal ion

blocking agent which inactivates the components contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, citric acid was used. POE was used as the surfactant, and the alkylglycidyl [group] was used as the bactericide. First of all, 100 parts by weight of water were heated to about 80°C. 40 parts by weight sulfamic acid and 10 parts by weight citric acid were loaded, stirred and completely dissolved. While the temperature of water did not fall significantly, 5 parts by weight POE oleylether and 0.5 parts by weight alkyl glycidyl were added, stirred, and allowed to stand at room temperature. In this way, a washing composition for coins was manufactured.

[0026]

60 coins of 5 yen and 60 coins of 10 yen (including 30 coins issued before 1989 and 30 coins issued in and after 1989) were loaded in 2 kg of the washing composition for coins prepared above, and washing by ultrasonic waves was carried out for 20 sec. Then, the coins were removed from the washing composition and were loaded in hot water at 90°C. The coins were subjected to ultrasonic washing for 20 sec. The coins were taken out and were dried by hot air at 50°C. For the 10-yen coins issued before 1989, although they were glossy, in order to completely recover the gloss, the coins were allowed to stand for about 1 h in an atmosphere at 70% RH, and the gloss became the same as that of the new coins.

[0027]

#### Function

In the aforementioned washing composition for coins, sulfamic acid, which has a stable corrosion effect on metal, is harmless to the human body, and can quickly remove the dirt attached on the surface of the coins by means of chemical reactions, is the most common type used. Consequently, it is possible to clean the coins indoors safely in a short time without an irritating odor or other offensive odor. Also, since the aforementioned washing composition contains citric acid as the metal ion blocking agent which inactivates the components contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, it is possible to promote the corrosion effect of the aforementioned organic acid, so that washing can be done in a shorter time. Also, as it is a food additive, it is safe even when the washing composition makes contact with the human body during washing operation.

[0028]

By using POE oleylether as the surfactant, it was possible to remove the dirt attached on the surface of the coins due to the function of the detergent. Also, it was possible to prevent reattachment of the dirt on the surface of the washed coins. In addition, by using alkylglycidyl as the bactericide, the coins were made to be antibacterial, that is, various species of bacteria cannot be attached on the surface of the coins after they are washed and reissued for circulation.

[0029]

When the aforementioned washing composition for coins was prepared, the water was heated to about 80°C, and stirring was performed in the operation to dissolve the added components quickly and completely. Also, when the aforementioned washing composition for coins was used to wash the coins using ultrasonic waves, there was no noise, and it was possible to obtain coins with good gloss quickly. The phrases and expressions adopted in this specification were used merely for explanation. They do not have definitive meanings, and they are not mean to exclude the phrases and expressions equivalent to the characteristics described in this specification. Naturally, various modifications can be adopted for the technical ideas of this invention.

[0030]

#### Effect of the invention

The aforementioned washing composition for coins has the following effects. The aforementioned washing composition for coins contains an organic acid which has a stable corrosion effect on metal and is harmless to the human body. Consequently, it is possible to clean the coins indoors safely in a short time without an irritating odor or other offensive odor. Also, since the aforementioned washing composition contains a metal ion blocking agent which inactivates the components contained in the water, acting to increase the hardness of the water and metal ions contained in the dirt, it is possible to promote the corrosion effect of the aforementioned organic acid, so that

washing can be done in an even shorter time. Also, as it is a food additive, it is safe even when the washing composition makes contact with the human body during washing operation. As it contains a surfactant, it is possible to remove the dirt attached on the surface of the coins, and it is possible to prevent reattachment of dirt on the surface of the washed coins. Also, it contains a bactericide, so that the so-called imparting of antibacterial property can be realized, that is, various species of bacteria are not attached when the coins are reissued for circulation after they are washed.

[0031]

When the aforementioned washing composition for coins is manufactured, usually, water is heated to 60-80°C, and stirring is performed in the operation, so that the added components can be dissolved quickly and completely. Also, when the washing composition for coins is used for washing coins, ultrasonic waves are used. Consequently, there is no noise, and washing can be performed quickly.